
वार्निश, स्पार और कवकनाशी — विशिष्टि
(पहला पुनरीक्षण)

Varnish, Spar and Fungicidal —
Specification
(First Revision)

ICS 87.040

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August 2023

Price Group 7

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints, Varnishes, and Related Products Sectional Committee had been approved by the Chemical Division Council.

The varnish, spar and fungicidal have good water, moisture, fungus resistance and outdoor durability. These varnishes are used as clear finishes for marine works, as a vehicle for marine enamels, floor and porch enamels and for moisture and fungus resistant treatment of telecommunication and optical instruments. The material is also used for the painting of wood or metal surfaces.

This standard was published in 1971. This revision has taken up in order to bring out the standard in the latest style and format of the Indian Standards. It also incorporates 2 amendments issued to the last version of standard. In addition, the following changes have been made:

- a) The maximum limit for lead has been specified considering its adverse impact on human health;
- b) The corresponding parts of IS 101 has been referred for the test methods procedure as earlier referred test method IS 197 has been withdrawn;
- c) A suitable precautionary note has been added in the marking clause in order to prevent unforeseen events; and
- d) References of Indian Standards have been updated wherever required.

The composition of the Committee responsible for the formulation of this standard is given in Annex L.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

*Indian Standard***VARNISH, SPAR AND FUNGICIDAL — SPECIFICATION***(First Revision)***1 SCOPE**

This standard prescribes the requirements and the methods of sampling and test for spar varnish, and fungicidal varnish.

NOTE — The material when formulated and used as a spar varnish, it is intended for protection, decoration and for moisture resistance treatment of substrates and when formulated and used as a fungicidal varnish, it is intended for protection, decoration and for fungus resistance treatment of substrates.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Indian Standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1303 and those given below shall apply.

3.1 Spar Varnish — Varnish specially formulated to have outstanding water-resistance and have good exterior durability.

3.2 Registered Sample — The sample supplied in advance by a prospective supplier and registered by the approved testing authority after testing it to the requirements of this standard. A complete record of its performance shall be kept in respect of all the tests.

4 TYPES

The material shall have the following types:

- a) *Type 1* — general spar varnish; and
- b) *Type 2* — fungicidal varnish.

5 REQUIREMENTS**5.1 Composition**

The material is generally oleoresinous phenolic varnish. However, the material shall be of such a composition as to satisfy the requirements of this standard.

5.2 Durability**5.2.1 Registered Sample**

5.2.1.1 When prepared and tested for normal outdoor exposure as prescribed under **B-4**, a general breakdown of the film prepared from the sample for registration shall not occur in less than 6 months.

5.2.1.2 A film of the material for the registration shall be prepared and tested as prescribed under **B-5** in an accelerated weathering apparatus for a period of 7 days and a complete record of its performance shall be maintained.

NOTE — As a precaution against inadvertent accidents, the outdoor exposure test (**B-4**) and the accelerated weathering test (**B-5**) shall be carried out in duplicate.

5.2.2 Sample from Bulk Supply

A film of the material prepared from a representative sample from the bulk supply as prescribed under Annex B and tested in the accelerated weathering apparatus (**B-5**) shall not be materially different in performance as compared with the record of the film of the registered sample. The film shall be examined daily for a period of 7 days.

5.3 Compatibility with Thinner

The material shall be compatible with thinners conforming to IS 1745 (low aromatic, 140/205) and when thinned down with 2 parts of thinner by volume, shall show no turbidity or separation of the resin.

5.4 Skinning

The varnish shall not skin within 48 hours in a three quarterly filled tightly-fit closed undisturbed container.

5.5 Resistance to Fungal Attack (for Type 2 Only)

The material shall pass the test as prescribed in Annex H.

5.6 Lead Restriction

The material shall not contain lead or compounds of lead or mixtures of both, as metallic lead more than 90 ppm, when tested for restriction from lead in accordance with IS 101 (Part 8/Sec 5).

5.7 The material shall also comply with the requirements prescribed in Table 1.

6 PACKING AND MARKING**6.1 Packing**

The material shall be packed as agreed to between the purchaser and the supplier.

6.2 Marking

Each container shall be marked with the following particulars:

- a) Name and type of the material;
- b) Name of the manufacturer or his recognized trade-mark, if any;
- c) Volume of the material;
- d) Batch No. or lot No. in code or otherwise;
- e) Month and year of manufacture;
- f) Lead content, max, as declared; and
- g) A cautionary note as below:
 - 1) Keep out of reach of children;
 - 2) Dried film of this paint may be harmful if eaten or chewed; and
 - 3) This product may be harmful if swallowed or inhaled.

6.2.1 BIS Certification Mark

The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 2016* and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7 SAMPLING

Representative samples of the material shall be drawn as prescribed under IS 101 (Part 1/Sec 1).

8 TEST METHODS

8.1 Tests shall be conducted as prescribed in **5.1** to **5.5**. The test methods referred to are given in col (4) of Table 1 and Annex A to K.

8.2 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

Table 1 Requirements for Varnish, Spar and Fungicidal

(Clauses 5.7 and 8.1)

| Sl No. | Characteristic | Requirement for Both the Types | Method of Test, Ref to | |
|--------|------------------------------|--|------------------------|-------|
| | | | IS | Annex |
| (1) | (2) | (3) | (4) | (5) |
| i) | Appearance | The varnish shall be clean, transparent, homogeneous and free from suspended impurities when examined by transmitted light | — | — |
| ii) | Drying time, h, <i>Max</i> : | | 101 (Part 3/Sec 1) | — |
| | a) Surface dry | 6 | — | — |
| | b) Hard dry | 12 | — | — |
| | c) Tack free | 24 | — | — |
| iii) | Finish | Smooth and glossy | 101 (Part 3/Sec 4) | — |
| iv) | Resistance to acid | Shall pass the test | — | C |
| v) | Resistance to alkali | Shall pass the test | — | D |
| vi) | Resistance to boiling water | Shall pass the test | — | E |
| vii) | Resistance to sea water | Shall pass the test | — | F |

Table 1 (Concluded)

| Sl No. | Characteristic | Requirement for Both the Types | Method of Test, Ref to | |
|--------|--|---|------------------------|-------|
| | | | IS | Annex |
| (1) | (2) | (3) | (4) | (5) |
| viii) | Gas proof test | Shall pass the test | — | G |
| ix) | Flexibility and adhesion, after 96 h air-drying | | 101 (Part 5/Sec 2) | — |
| | a) Scratch hardness (at load 1 000 g) | No such scratch as to show the bare metal | — | — |
| | b) Bent test with 6.25 mm dia. Mandrel | No visible damage or detachment of film | — | — |
| x) | Stripping test after 96 h air-drying | Scratches free from jagged edges | — | J |
| xi) | Flash point, °C, <i>Min</i> | 30 | 101 (Part 1/Sec 6) | — |
| xii) | Volatile matter content, percent by weight, <i>Max</i> | 60 | 101 (Part 2/Sec 2) | — |
| xiii) | Viscosity at 30 °C | 1.50 to 3.00 stokes | 101 (Part 1/Sec 5) | — |
| xiv) | Keeping properties | Not less than one year from the date of manufacture | — | K |

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

| <i>IS No.</i> | <i>Title</i> | <i>IS No.</i> | <i>Title</i> |
|----------------|--|----------------|--|
| IS 101 | Methods of sampling and test for paints, varnishes and related products: | (Part 7) | Environmental tests on paint films, |
| (Part 1) | Tests on liquid paints (general and physical), | (Sec 1) : 1989 | Resistance to water (<i>third revision</i>) |
| (Sec 1) : 1986 | Sampling (<i>third revision</i>) | (Part 8) | Tests for pigments and other solids, |
| (Sec 5) : 1989 | Consistency (<i>third revision</i>) | (Sec 5) : 2022 | Lead restriction test (<i>first revision</i>) |
| (Sec 6) : 1987 | Flash point (<i>third revision</i>) | (Part 9) | Tests for lacquers and varnish |
| (Part 2) | Test on liquid paints (chemical examination), | (Sec 1) : 1993 | Acid value (<i>third revision</i>) |
| (Sec 2) : 1986 | Volatile matter (<i>third revision</i>) | IS 198 : 1978 | Specification for varnish, gold size (<i>first revision</i>) |
| (Part 3) | Tests on paint film formation, | IS 266 : 1993 | Sulphuric acid — Specification (<i>third revision</i>) |
| (Sec 1) : 1986 | Drying time (<i>third revision</i>) | IS 285 : 2021 | Laundry soaps — specification (<i>fourth revision</i>) |
| (Sec 4) : 1987 | Finish (<i>third revision</i>) | IS 296 : 1986 | Specification for sodium carbonate, anhydrous (<i>third revision</i>) |
| (Part 4) | Optical tests, | IS 1017 : 1983 | Specification for chamois leather (<i>second revision</i>) |
| (Sec 2) : 2021 | Colour-visual comparison of colour of paints (<i>fourth revision</i>) | IS 1070 : 2023 | Reagent grade water — Specification (<i>fourth revision</i>) |
| (Part 5) | Mechanical test on paint films, | IS 1303 : 1983 | Glossary of terms relating to paints (<i>second revision</i>) |
| (Sec 1) : 1988 | Hardness tests (<i>third revision</i>) | IS 1745 : 2018 | Petroleum hydrocarbon solvents — Specification (<i>third revision</i>) |
| (Sec 2) : 1988 | Flexibility and adhesion (<i>third revision</i>) | | |
| (Part 6) | Durability test on paint films, | | |
| (Sec 2) : 1989 | Keeping properties (<i>third revision</i>) | | |

ANNEX B

(Clause 5.2)

TEST FOR DURABILITY

B-1 GENERAL

B-1 Outline of Method

The durability of the varnish is determined ascertaining actual behavior of suitably prepared test panels in normal outdoor exposure test for a specified period and evaluating the results of this exposure by a suitable method of rating for various characteristics of the varnish film. Apart from this, the varnish is also evaluated by an accelerated weathering test wherein a prepared panel is subjected to controlled exposure of heat, light and water in an artificial weathering apparatus.

B-2 TEST PANELS

The panels shall be seasoned teakwood conforming to the requirements given in IS 101 (Part 1/Sec 3). The panel for outdoor exposure shall be 300 mm × 150 mm × 25 mm in size and or the accelerated weathering test 150 mm × 75 mm × 12 mm. The panels shall be levelled at the edges and shall be smoothened by rubbing down with fine emery paper, the back being protected with a suitable paint.

B-3 PREPARATION OF TEST PANELS

B-3.1 In the painting procedure outlined under **B- 3.2**, the air-drying shall be done at the room temperature and at a relative humidity of not more than 70 percent.

B-3.2 The surface of the test panels to be exposed shall be prepared as follows:

- a) Apply one coat of liquid, transparent wood filler and remove the excess after it has dried to touch, by rubbing across the grains with jute fibres or hessian cloth, and allow it to air-dry for 24 hours.
- b) Rub down with zero glass paper and wipe off the dust, apply one coat of varnish, gold size (conforming to IS 198) and allow it to air-dry for 24 hours.
- c) Rub down with waterproof emery paper No. 220/240, wash and wipe off water, and when dry, apply one coat of varnish, finishing, exterior, synthetic air drying (conforming to IS 524) and allow it to air-dry for 24 hours.
- d) Rub down with waterproof emery paper No. 320, wash and wipe, off water, and when dry, apply one coat of the material, and allow it to air-dry for 48 hours.

- e) Rub down with waterproof emery paper No. 320, wash and wipe off water, and when dry, apply a second coat of the material, and allow it to air-dry for 7 days.

B-4 NORMAL OUTDOOR EXPOSURE TEST

B-4.1 Subject the sample for registration and the tender samples, in supplied, to normal outdoor exposure test in the manner described under **A-4.2**.

B-4.2 Expose in open the test, panels, prepared in the manner prescribed under **B-2** and **B-3** in duplicate, in a vertical position facing south. Commence the exposure not earlier than the last week of January and not later than the first week of March (*see Note*).

NOTE — The timeline of the exposure test specified to accommodate all weather conditions

B-4.2.1 Examine the condition of the exposed films at monthly intervals for gloss retention and at bimonthly intervals for other characteristics, as given below:

- a) Checking; and
- b) Blooming and spotting.

B-4.2.2 For the above examinations, clean half the surface of the two test panels with a sponge dipped in water and wipe it dry with a piece of soft cotton or chamois leather (*see IS 1017*). Prior to examination, examine the same half of the test panels at each examination. As an aid to the examination, a magnifying glass may be used, but the evaluation shall be based on an assessment with the unaided eye. At the end of the stipulated period for durability, examine both halves of the test panels and base the evaluation for rating (*see B-4.4*) on the condition of the unwiped half of the test panels, which shall be wiped before the visual examination.

A-4.3 Method of Rating

The film of an unexposed test panel shall be rated with the following basic values for the respective characteristics:

| | |
|---------------------------------------|------------------|
| a) Possessing high gloss | 40 |
| b) Freedom from checking | 45 |
| c) Freedom from blooming and spotting | <u>15</u> 100 |

NOTE — The initial rating of film may be 100 or less according to the condition of gloss, the rating for freedom from checking, blooming and spotting being always the maximum in the case of unexposed films.

B-4.4 Evaluation of Exposed Films

In recording the condition of exposed films at each examination, express the observed relative values of different characteristics in percentages of the basic value allotted to each characteristic under **B-4.3**. The allotment of performance value should be multiples of 10. For arriving at an assessment, multiply the basic value for each characteristic (*see B-4.3*) by

the percentage awarded for the performance in the test and divide the product so obtained by 100 to obtain the percentage awarded for the observed value of each characteristic. Take the sum total of these resulting values as the overall assessment.

B-4.4.1 The following table is intended to serve as an example for the assessment of a varnish film after exposure:

| <i>Sl No.</i> | <i>Characteristic</i> | <i>Basic Value, Percent</i> | <i>Performance Value, Percent</i> | <i>Assessment Value, Percent</i> |
|---------------|---------------------------------------|---------------------------------|---------------------------------------|--------------------------------------|
| (1) | (2) | (3) | (4) | (5) |
| i) | Possessing high gloss | 40 | 100 | 40 |
| ii) | Freedom from checking | 45 | 50 | 22.5 |
| iii) | Freedom from blooming and spotting | 15 | 20 | 3 |
| | | | | 65.5 |

B-4.5 Results of Exposure

Reckon the period for the general breakdown of the exposed film from the data of commencement of exposure to the time when the overall assessment falls below 50 percent or when the performance value of any one characteristic except for gloss which shall be 50 percent, falls below 25 percent of the basic value adopted for that characteristic. In the example given under **B-4.4.1**, although the overall assessment is 65.5 percent, yet the film is to be regarded as generally having broken down, because the performance value of blooming and spotting has fallen below 25 percent of its basic value.

type for uniform and controlled exposure to the effects of heat, light and water.

B-5.2 Samples for registration shall be tested in duplicate in a suitable accelerated weathering apparatus (*see B-5.1*) and samples drawn from bulk supply shall be tested in a similar manner. The test panels shall be prepared as described under **B-5.2**. The requirements of this test shall be taken to have been satisfied if the performance of the film is not materially different as compared with the record of the film of the registered sample.

B-5 ACCELERATED WEATHERING TEST**B-5.1 Accelerated Weathering Apparatus**

An artificial weathering apparatus of the carbon arc

ANNEX C

[Table 1 (iv)]

TEST FOR RESISTANCE TO ACID

C-1 GENERAL

C-1.1 Outline of Method

A test panel coated with the varnish, after specified drying period, is immersed in a definite concentration of sulphuric acid for 24 hours after which it is washed, dried and the film examined for loss of gloss and disintegration.

C-2 PROCEDURE

C-2.1 Apply a coat of the varnish by brushing or spraying on a 150 mm × 100 mm clean glass panel to give a dry film weight commensurate with the

weight in kg/10 litres of the material. Allow the panel to air-dry in a horizontal position for 48 hours at $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and relative humidity of 65 percent ± 2 percent. Protect the edges of the panel by applying a coat of wax. Immerse the panel in a 2 percent (w/v) solution of sulphuric acid (sp gr 1.84 conforming to IS 266) for 24 hours at room temperature. Remove the panel, wash in running fresh water and allow to dry for an hour.

C-2.2 The film shall not show signs of disintegration and loss of gloss from the original not more than 40 percent as determined by gloss meter at 45° specular reflection.

ANNEX D

[Table 1 (v)]

TEST FOR RESISTANCE TO ALKALI

D-1 GENERAL

D-1.1 Outline of Method

The film of the material is tested with a solution of laundry soap followed by a solution of sodium carbonate by the procedure specified under **D-2**.

D-2 PROCEDURE

D-2.1 Immerse a panel prepared as described in Annex B in a one percent (w/v) solution of laundry soap, Grade 1 (conforming to IS 285) for half an hour at a temperature of $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$. Remove, wash in running water, dry for an hour and examine the

film and then subject to test as prescribed under **D-2.2**.

D-2.2 Immerse the panel in a solution of sodium carbonate, analytical reagent grade (conforming to IS 296) containing two percent (w/v) of sodium carbonate (Na_2CO_3) for half an hour at a temperature of $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$. Remove, wash in running water, dry for an hour and examine the film.

D-2.3 After each of the tests described under **D.2.1** and **D-2.2**, the film shall not show signs of disintegration and loss of gloss from original not more than 40 percent as determined by gloss meter at 45° specular reflection.

ANNEX E

[Table 1 (vi)]

TEST FOR RESISTANCE TO BOILING WATER

E-1 GENERAL

E-1.1 Outline of Method

The varnish coated panel, after specified drying period, is immersed in boiling distilled water for 15 minutes and examined for any signs of deterioration and change in gloss.

E-2 PROCEDURE

E-2.1 Apply a coat of material to a glass panel

prepared as prescribed in IS 101 (Part 1/Sec 3) to give a dry film weight commensurate with weight per 10 litres of the material as specified in Table 2. Allow the varnish to air-dry in a horizontal position for 48 hours. Prepare another panel similarly under identical conditions and use as control panel. Immerse one of the panels in boiling distilled water (conforming to IS 1070) for 15 minutes. Remove it from water and examine after 2 hours.

**Table 2 Weight per 10 litres Wet Material and Their Corresponding
Dry Film Weight of the Material**
(Clause E-2.1 and F-4.1)

| Sl No. | Weight of the Wet Material | Limits of Dry Film Weight |
|--------|----------------------------|---------------------------|
| | kg/10l | g/m ² |
| (1) | (2) | (3) |
| i) | Up to 12 | 27 to 34 |
| ii) | Over 12 and up to 14 | 34 to 44 |
| iii) | Over 14 and up to 16 | 44 to 54 |
| iv) | Over 16 and up to 18 | 54 to 68 |
| v) | upto 18 | 68 to 80 |

E-2.2 The film shall show no signs of deterioration or any whitening, dulling or other visible defects

when compared with that of the film of the control panel.

ANNEX F

[Table 1 (vii)]

TEST FOR RESISTANCE TO EITHER NATURAL OR ARTIFICIAL SEA WATER

F-1 GENERAL

F-1.1 Outline of Method

The varnish coated panel after specified drying period is immersed either in the natural sea water or artificial sea water prepared as shown below, at room temperature and examined for any signs of deterioration such as blistering, flaking, under-film corrosion or visible damage after 7 days' continuous immersion.

F-2 COMPOSITION OF NATURAL SEA WATER

F-2.1 The natural sea water shall have a pH of 7.9 to 8.3 and a chlorinity of not less than 17 parts and salinity of 31 parts per 1 000.

NOTE — The chlorinity and consequently salinity of natural sea water on the Indian coast line is subjected to variations due to monsoon. Dilution occurs during this period, lowering these values considerably. This period usually varies from 3 months to 4 months during the year. In the other months, salinity is equal to or even higher than synthetic sea water but seldom exceeds 36 parts to 37 parts. This rise in salinity, however, has not a very significant effect on the test.

F-3 COMPOSITION OF ARTIFICIAL SEA WATER

F-3.1 Dissolve the specified weights of the following salts and make up with freshly distilled water to give 1 000 ml of the solution:

| Sl No. | Salt | Weight (g) |
|------------------------------|--|---------------|
| (1) | (2) | (3) |
| i) | Sodium chloride (NaCl) | 23.476 |
| ii) | Magnesium chloride (MgCl ₂) | 4.981 |
| iii) | Sodium sulphate (Na ₂ SO ₄) | 3.917 |
| iv) | Calcium chloride (CaCl ₂) | 1.102 |
| v) | Potassium chloride (KCl) | 0.664 |
| vi) | Sodium bicarbonate (NaHCO ₃) | 0.192 |
| vii) | Potassium bromide (KBr) | 0.096 |
| viii) | Boric acid (H ₂ BO ₃) | 0.026 |
| ix) | Strontium chloride (SrCl ₂) | 0.024 |
| x) | Sodium fluoride (NaF) | 0.003 |
| | Total | <u>34.481</u> |
| Water to make : 1 000.000 ml | | |

F-3.1.1 The artificial sea water thus prepared on thorough aeration produces a pH between 7.9 and 8.3 which is most suitable for the test.

F-4 PROCEDURE

F-4.1 Apply a coat of material to a mild steel panel prescribed in IS 101 (Part 1/Sec 3) to give a dry film weight commensurate with weight in kg per 10 litres of the material as specified in Table 2. Allow the varnish to air-dry for 48 hours. The surface so air-dried then be slightly sanded down after which a second coat of the material shall be given so as to

give a total film weight of 34 g to 50 g per sq metre. The panel shall then be allowed to stand at room temperature for 72 hours. Protect the edges of the panel with wax. Immerse the panel in natural or artificial sea water continuously for 7 days. Remove it and examine after 2 days.

F-4.2 The film shall show no visible damage, blistering, flaking or under film corrosion.

ANNEX G

[Table 1 (viii)]

GAS PROOF TEST**G-1 GENERAL****G-1.1 Outline of Method**

The varnish coated panel shall show no dullness, frosting, crows-footing, or other defects when subjected to gas proof test as mentioned in **G-2.1**.

G-2 PROCEDURE

G-2.1 A clear glass plate (a microscopic slide) shall be coated on one side with the material under test to give a dry-film weight of 2.65 mg/cm² to 3.10 mg/cm².

The glass plate shall then be placed, varnished side uppermost, upon a strip of cardboard of the same size on the central shelf of a suitable oven maintained at a temperature of about 38 °C until the varnish film on the glass plate is dry. Care should be taken to ensure that the perforations in the shelf are not covered up.

A suitable oven for this test is a copper air-oven 15 cm × 15 cm, centre having a hole of 2.5 cm to 3.0 cm in diameter in the middle of its floor and contain a perforated copper shelf placed centrally. At the top of the oven, 2 vents about 1.25 cm in diameter are provided, one of which is left open and the other is fitted with the cork through which the thermometer passes so that its bulb reaches to the central shelf.

A small kerosine lamp or stove giving a luminous flame is placed underneath the hole in the oven floor at such a distance that the tip of the flame is about 10 cm from the plane of the floor. Slight adjustments to the size of the flame may be made in order to maintain the specified temperature.

The glass panel is removed and the film of the varnish when examined shall show no dullness, frosting, crow-footing or other defects.

ANNEX H

(Clause 5.5)

TEST FOR RESISTANCE TO FUNGAL GROWTH**H-1 GENERAL****H-1.1 Outline of Method**

The filter paper coated with the material is inoculated with spore suspension of standard cultures and incubated at 28 °C to 30 °C for 7 days. The papers are examined against control panels for fungal growth.

H-2 APPARATUS**H-2.1 Autoclave**

Capable of maintaining a temperature of 122 °C ± 2 °C at a pressure of 1.08 kg/cm² ± 0.03 kg/cm² for sterilizing the culture medium and glassware.

H-2.2 Culture Flask

A suitable flask for sterilizing and storing the culture

medium.

H-2.3 Petri Dishes — 10 cm in diameter**H-2.4 Sterile Room**

A dust free room in which to inoculate the specimens. Sterile lamps, antiseptic spray or air filtered under pressure may be used to maintain sterile conditions.

H-2.5 Incubator Chamber

A chamber whose atmosphere may be maintained at 29 °C ± 1 °C and a relative humidity of 92.5 percent ± 2.5 percent.

H-3 REAGENTS**H-3.1 Viability Control Medium**

The nutrient medium used for determining the

viability of the organism during the incubation of the test specimen shall have the following composition:

| | |
|---|----------|
| Ammonium nitrate (NH ₄ NO ₃) | 1.2 g |
| Dipotassium monohydrogen phosphate (K ₃ HPO ₄) | 1.0 g |
| Magnesium sulphate (MgSO ₄ ·7H ₂ O) | 0.5 g |
| Potassium chloride (KCl) | 0.5 g |
| Ferrous sulphate (FeSO ₄) | 0.01 g |
| Glucose | 1.0 g |
| Agar | 25.0 g |
| Water | 1 000 ml |

H-3.2 Organisms (see Note)

The test organisms shall be of a mixed spore suspension in sterilized distilled water comprising the following standard cultures:

- Aspergillus niger*;
- Pencillium* sp;
- Rhizopus nigricans*; and
- Monillia* sp.

NOTE — These cultures are available from Defence Research Laboratory (Materials), Kanpur.

H-4 PROCEDURE

H-4.1 Preparation of the Test Specimens

Apply by brushing with a 25 cm brush a normal coat of the varnish to both sides of a sheet of medium grade filter paper, allowing sufficient time for one side to dry before coating the reverse side. Age the coating for 48 h, cut the sheet into 8 cm² squares. Make a 6.5 cm² squares on the test specimen by drawing guidelines 0.75 cm from each edge with black waterproof ink. Cut 8 cm² squares of the same filter paper and mark on them 6.5 cm² squares to serve as controls.

H-4.1.1 Immerse the test specimens in distilled water in such a way that all the surfaces will have

free access to the water. Apply a continuous flow of distilled water at 27 °C ± 2 °C to the bottom of the container at a rate that will give five changes of water per day. The water used for each specimen shall be not less than 100 ml. After 24 h remove the paper and allow it to air-dry.

H-4.1.2 Preparation of Culture Medium

Thoroughly mix the nutrient medium in the culture flask and place it in an autoclave until the medium has melted. Transfer about 25 ml of the medium to each petri dish and allow to stand undisturbed till it has hardened. Sterilize each dish in the autoclave for 20 minutes. Remove from autoclave and allow it to harden. When not in use the dishes and medium shall be kept at 3 °C to 5 °C.

H-4.1.3 Inoculation

Lay three of the test specimens prepared and aged as described in **G-3.1** and **G-3.1.1** firmly on the surfaces of the culture medium in three petri dishes with the guidelines showing. Arrange a control square on the culture medium in another petri dish similarly. Using a sterile pipette, distribute 1.5 ml to 2.0 ml of the spore suspension uniformly over the surface of each test specimen and of control square and as well as the surrounding culture medium.

H-4.1.4 Incubation

Incubate the test specimens and control for 7 days in the incubation chamber at 28 °C to 30 °C and at a relative humidity of 90 percent to 95 percent.

H-4.1.5 Examination

At the end of the incubation period examine all these test specimens and the control for extent of growth of the organism. If at the end of the test period any sporulation of the test organism occurs within the guidelines on a test specimen, the material is considered to have failed on the test.

If the viability control specimen has failed to develop a heavy growth of the test organism at the end of the incubation period, discard all specimens and repeat the test.

ANNEX J

STRIPPING TEST

[Table 1 (x)]

J-1 OUTLINE OF THE METHOD

The minimum load required to produce a scratch showing the bare metal surface of the panel coated with the material is determined.

J-2 APPARATUS

The apparatus used for determining the scratch

hardness as prescribed in IS 101 (Part 5/Sec 2) shall be used.

J-3 PROCEDURE

Apply a coat of the material by either brushing or spraying, whichever is specified in the material specification, to a 150 mm × 50 mm × 0.315 mm tinned mild steel panel prepared as described in

IS 101 (Part 1/Sec 3). Allow the panel to air-dry in a horizontal position for 96 h under specified drying conditions or stove as specified in the material specification. Condition the test panels at standard atmospheric conditions for at least 26 h before testing. Test the dried film in the apparatus under

such a load that a scratch is produced showing the bare metal surface.

J-3.1 The scratch so produced shall be free from jagged edges.

ANNEX K KEEPING PROPERTIES

[Table 1 (xiv)]

When stored under cover in a dry place in the original sealed containers under normal temperature conditions, the material shall meet the requirement as specified in **5** for the specified period after the

date of manufacture. Slight changes in viscosity may be allowed provided the material satisfies the other requirements prescribed in the material specification.

ANNEX L*(Foreword)***COMMITTEE COMPOSITION**

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This Indian Standard has been developed from Doc No.: CHD 20 (20535).

Amendments Issued Since Publication

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|-----------|---------------|---------------|
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